國立高雄應用科技大學
100 學年度碩士班招生考試
資訊工程系

准考證號碼□□□□□□□□□□ （考生必須填寫）

資料結構

注意：a. 本試題共 11 題，共 100 分。
b. 作答時不必抄題。
c. 考生作答前請詳閱答案卷之考生注意事項。

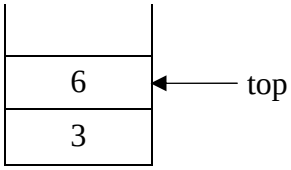
1. (5%) Convert the following expression into postfix form.
((a – b) / d) * (e – a) + c

2. (10%) (答案需分別畫出 3 個圖)

```
void push (int item) {
   stack[++top] = item;
}
```

```
int pop( ) {
   return stack[top--];
}
```

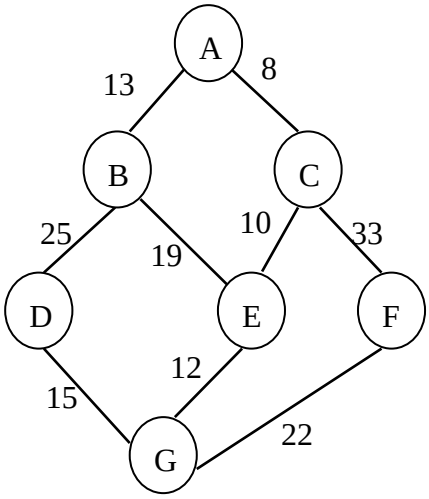
Assume the current content of the stack is as in the right figure. Please update its content, along with the top pointer, after each of the following 3 function calls:
pop( );
push(9);
push(6);



3. (10%) Draw the binary tree whose in-order sequence is ACIFHJGDBE and whose pre-order sequence is EHCAFIDGJB.

4. (10%) Given the following 8 keys: 60 93 25 14 71 88 31 69,
   a. (5%) perform a selection sort step by step
   b. (5%) perform a merge sort step by step

5. (10%)
   a. (5%) Find the minimum-cost spanning tree of the following graph.
   b. (5%) Starting from node A and ignoring edge cost, find the breadth-first-search tree, or breadth-first-search sequence of the following graph.

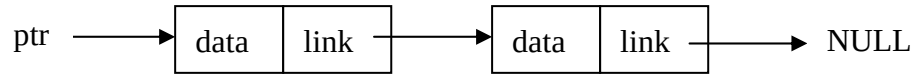


6. (10%) (use C/C++, Java)
   Finish the following non-recursive function to do a binary search of a key, in a sorted array numbers[] of size N. The function returns TRUE if key is found in the array, FALSE otherwise.

```
Boolean binarySearch( int numbers[] , int key, int N ) {
        int head = 0, tail = N – 1;
        while( head <= tail ){
              int middle = (head + tail) / 2;
              if ( key == numbers[middle] )
                    return TRUE;
              else if ( key > numbers[middle] )
                    _____________
              else if ( key < numbers[middle] )
                    _____________
        }
        return FALSE;
}
```

7. (10%) (use C/C++)

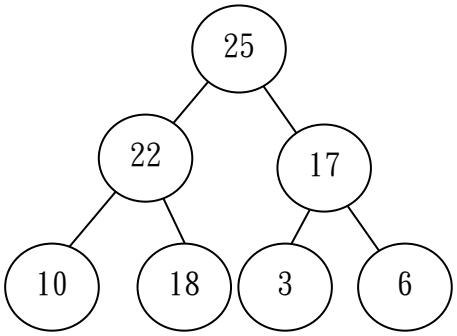
   Assume the structure of the linked list is as follows:



   Finish the following function (using C/C++) to calculate the length of a linked list.

```
int length (node *ptr){
        int count ;
        if( _________________ )
              return 0;
        for ( count = 0; _________________ ; _____________________)
              count++ ;
        return count;
}
```

8. (10%)　Describe, in detail, the pop (or delete) process on the following max-heap. What is the return value?



9. (10%)　Draw 3 different balanced binary search trees, each of which consists of nodes A, B, C, D.

10. (5%)　How to handle overflow when using a hash table?

11. (10%)　Briefly describe how Dijkstra's algorithm (finding shortest path) works. And explain why it doesn't work on graphs with negative edges. (Use an example to explain if needed.)